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RYAN, MASON & LEWIS, LLP
1300 POST ROAD
SUITE 205
FAIRFIELD, CT 06824

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GU, YU	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/562,617	DRIESEN ET AL.	
	Examiner	Art Unit	
	YU (Andy) GU	2617	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 November 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Prosecution Re-opened

1. In response to the Appeal Brief filed by the Applicant on 11/30/2010, the Examiner has reconsidered and decided to re-open prosecution. Previously cited prior arts may be used to form rejections on new ground (s).

Status of Claims

2. Applicant's amendment filed on 8/17/2010 is entered. Accordingly, claims 1-30 are pending.

Claim Rejections - 35 USC § 103

3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

4. **Claims 1, 4, 8-10, 12-13, 15, 18, 22-23** and **25-30** are rejected under 35 U.S.C. 103(a) as being unpatentable over US 7352688 B1 Perahia et al. (hereinafter Perahia) in view of US 20070064586 A1 Ma et al. (hereinafter Ma), and further view of US 6005876 A Cimini et al. (hereinafter Cimini).

Regarding **claim 1**, Perahia discloses *a method for transmitting data in a multiple antenna communication system having N* (see at least column 4 lines 16-21) *transmit antennas* (see at least Abstract)*, said method comprising the step of:*

- *transmitting a legacy preamble having at least one long training symbol* (see at least column 5 lines 24-45) *on each of said N transmit antennas* (see at least Figure 5 and column 6 lines 29-34, where it is shown two antennas each transmits long training symbols)*, and at least one additional* (e.g. two long

training symbols as shown in Figure 5) *long training symbol* (see at least column 5 lines 24-45),

- *each of said long training symbols having a plurality* (e.g. 64 subcarrier values) *of subcarriers* (see at least column 3 lines 50-67),

Perahia may have failed to disclose *each of said long training symbols to be transmitted on each of said N transmit antennas having two or more portions, each of said N transmit antennas having a set of a plurality of subcarriers, where in each of said sets of said plurality of subcarriers are grouped into a plurality of subcarrier subgroups, wherein each subcarrier subgroup comprises tow or more adjacent subcarriers and wherein each portion of each long training symbol is transmitted on a different transmit antenna in a given time interval using on of plurality of subcarrier subgroup.* However, in an analogous art, Ma discloses transmitting a symbol (e.g. header symbol) in which sub-carriers of a header OFDM symbol are divided into a set of sub-carriers for each plurality of antennas, with each antenna transmitting the header symbol only on the respective set of subcarriers (i.e. each antennas has a set of subcarriers different from others) (see at least Ma paragraph [0017] - [0018]). It would have been obvious for a person of ordinary skill in the art at the time of the invention to modify Perahia in view of Ma, by transmitting the long symbol with different set of subcarriers on different antennas in order to realize the advantages (e.g. spatial diversity) of the OFDM system. The Examiner notes that the sub-carriers set of Ma contains non-contiguous subcarriers rather than the adjacent subcarriers as claimed. However, in yet another analogous art, Cimini discloses providing particular adjacent subcarriers (e.g. adjacent tones) set to

each antennas for transmitting (see at least Cimini column 3 lines 24-35). It would have been obvious to a person or ordinary skill in the art at the time of the invention to modify Perahia and Ma further, by alternatively using adjacent subcarrier set, in order to facilitate OFDM communication in a known manner.

Regarding **claim 4**, Perahia as modified by Ma and Cimini discloses the limitations as shown in the rejection of claim **1**. Perahia further discloses:

- *wherein each of said transmit antennas transmits a total of N* (e.g. 2) *long training symbols* (see at least Figure 5 and column 6 lines 29-45).

Regarding **claim 8**, Perahia as modified by Ma and Cimini discloses the limitations as shown in the rejection of claim **1**. Perahia further discloses:

- *wherein said legacy preamble further comprises at least one short training symbol* (see at least Figure 5 and column 5 lines 30-35).

Regarding **claim 9**, Perahia as modified by Ma and Cimini discloses the limitations as shown in the rejection of claim **1**. Perahia further discloses:

- *wherein said legacy preamble further comprises at least one SIGNAL field* (see at least Figure 5 and column 6 lines 52-57).

Regarding **claim 10**, Perahia as modified by Ma and Cimini discloses the limitations as shown in the rejection of claim **1**. Perahia further discloses:

- *wherein said legacy preamble is an 802.11 a/g preamble* (see at least column 6 lines 32-36).

Regarding **claim 12**, Perahia as modified by Ma and Cimini discloses the limitations as shown in the rejection of claim **1**. Perahia further discloses:

- *wherein N is two and wherein said transmitting step further comprises* (see at least Figure 1-3)
    - *the step of transmitting a legacy preamble having at least one long training symbol and one additional long training symbol* (e.g. total of 2 LTS)*on each of said two transmit antennas* (see at least Figure 5),
    - *wherein half of the subcarriers* (e.g. subcarrier 0-31 of the 64 subcarriers, along with the subcarrier 32-64 of the 64 subcarriers) *of the long training symbol are in a first subcarrier subgroup* (as applied to the first antenna) *and the remaining half of the subcarriers* (e.g. subcarrier 32-64 of the 64 subcarriers, along with the subcarrier 0-31 of the 64 subcarriers) *of the long training symbol are in a second subcarrier subgroup* (e.g. as applied to the second antenna) (see at least column 3 lines 54-60, column 4 lines 17-22 and column 5 lines 16-27).

Regarding **claim 13**, Perahia as modified by Ma and Cimini discloses the limitations as shown in the rejection of claim **1**. Perahia further discloses:

- *whereby a lower order receiver* (e.g. SISO receiver) *can interpret said transmitted data* (see at least column 9 lines 44-65).

Regarding **claim 15**, Perahia discloses a *transmitter in a multiple antenna communication system, comprising:*

- *N transmit antennas* (see at least Figure. 3) *for transmitting a legacy preamble having at least one long training symbol* (see at least column Figure 5 lines 24-45),

- *and at least one additional long training symbol*(e.g. two long training symbols as shown in Figure 5) *on each of said N transmit antennas* (see at least column Figure 5 lines 24-45),
- *each of said long training symbols having a plurality of subcarriers*(see at least column 3 lines 50-67),

Perahia may have failed to disclose *each of said long training symbols to be transmitted on each of said N transmit antennas having two or more portions, each of said N transmit antennas having a set of a plurality of subcarriers, where in each of said sets of said plurality of subcarriers are grouped into a plurality of subcarrier subgroups, wherein each subcarrier subgroup comprises tow or more adjacent subcarriers and wherein each portion of each long training symbol is transmitted on a different transmit antenna in a given time interval using a subcarrier subgroup.* However, in an analogous art, Ma discloses transmitting a symbol (e.g. header symbol) in which sub-carriers of a header OFDM symbol are divided into a set of sub-carriers for each plurality of antennas, with each antenna transmitting the header symbol only on the respective set of subcarriers (i.e. each antennas has a set of subcarriers different from others) (see at least Ma paragraph [0017] - [0018]). It would have been obvious for a person of ordinary skill in the art at the time of the invention to modify Perahia in view of Ma, by transmitting the long symbol with different set of subcarriers on different antennas in order to realize the advantages (e.g. spatial diversity) of the OFDM system.

The Examiner notes that the sub-carriers set of Ma contains non-contiguous subcarriers rather than the adjacent subcarriers as claimed. However, in yet another analogous art,

Cimini discloses providing particular adjacent subcarriers (e.g. adjacent tones) set to each antennas for transmitting (see at least Cimini column 3 lines 24-35). It would have been obvious to a person or ordinary skill in the art at the time of the invention to modify Perahia and Ma further, by alternatively using adjacent subcarrier set, in order to facilitate OFDM communication in a known manner.

Regarding **claim 18**, Perahia as modified by Ma and Cimini discloses the limitations as shown in the rejection of claim **15**. Perahia further discloses:

- *wherein each of said transmit antennas transmits a total of N long training symbols* (see at least Figure 5 and column 6 lines 29-45).

Regarding **claim 22**, Perahia as modified by Ma and Cimini discloses the limitations as shown in the rejection of claim **15**. Perahia further discloses:

- *wherein said legacy preamble further comprises at least one SIGNAL field* (see at least Figure 5 and column 6 lines 52-57).

Regarding **claim 23**, Perahia as modified by Ma and Cimini discloses the limitations as shown in the rejection of claim **15**. Perahia further discloses:

- *wherein said legacy preamble is an 802.11 a/g preamble*(see at least column 6 lines 32-36).

Regarding **claim 25**, Perahia as modified by Ma and Cimini discloses the limitations as shown in the rejection of claim **15**. Perahia further discloses:

- *wherein N is two and wherein said two transmit antennas comprises* (see at least Figure 1-3) *transmit a legacy preamble having at least one long training symbol and one additional long training symbol* (e.g. total of 2 LTS) *on each of said two*

transmit antennas (see at least Figure 5), *wherein half of the subcarriers*(e.g. subcarrier 0-31 of the 64 subcarriers, along with the subcarrier 32-64 of the 64 subcarriers) *of the long training symbol are in a first subcarrier subgroup* (as applied to the first antenna) *and the remaining half* (e.g. subcarrier 32-64 of the 64 subcarriers, along with the subcarrier 0-31 of the 64 subcarriers) *of the subcarriers of the long training symbol are in a second subcarrier subgroup*(e.g. as applied to the second antenna) (see at least column 3 lines 54-60, column 4 lines 17-22 and column 5 lines 16-27).

Regarding **claim 26**, Perahia as modified by Ma and Cimini discloses the limitations as shown in the rejection of claim **15**. Perahia further discloses:

- *whereby a lower order receiver* (e.g. SISO receiver) *can interpret said transmitted data*(see at least column 9 lines 44-65).

Regarding **claim 27**, Perahia discloses *a method for receiving data* (see at least Figure 2) *on at least one receive antenna transmitted by a transmitter having N* (see at least column 4 lines 16-21) *transmit antennas in a multiple antenna communication system, said method comprising the steps of:*

- *receiving a legacy preamble having at least one long training symbol and an indication of a duration of a transmission of said data,*
    - *and at least one additional long training symbols on each of said N transmit antennas*(see at least column Figure 5 lines 24-45),
    - *each of said long training symbols having a plurality of subcarriers*(e.g. 64 subcarrier values) *of subcarriers* (see at least column 3 lines 50-67),

- *and deferring for* an *indicated duration* (see at least Figure 5 and column 6 lines 38-45).

Perahia may have failed to disclose *each of said long training symbols to be transmitted on each of said N transmit antennas having two or more portions, each of said N transmit antennas having a set of a plurality of subcarriers, where in each of said sets of said plurality of subcarriers are grouped into a plurality of subcarrier subgroups, wherein each subcarrier group comprises tow or more adjacent subcarriers and wherein each portion of each long training symbol is transmitted on a different transmit antenna in a given time interval using a subcarrier subgroup.* However, in an analogous art, Ma discloses transmitting a symbol (e.g. header symbol) in which sub-carriers of a header OFDM symbol are divided into a set of sub-carriers for each plurality of antennas, with each antenna transmitting the header symbol only on the respective set of subcarriers (i.e. each antennas has a set of subcarriers different from others) (see at least Ma paragraph [0017] - [0018]). It would have been obvious for a person of ordinary skill in the art at the time of the invention to modify Perahia in view of Ma, by transmitting the long symbol with different set of subcarriers on different antennas in order to realize the advantages (e.g. spatial diversity) of the OFDM system.

The Examiner notes that the sub-carriers set of Ma contains non-contiguous subcarriers rather than the adjacent subcarriers as claimed. However, in yet another analogous art, Cimini discloses providing particular adjacent subcarriers (e.g. adjacent tones) set to each antennas for transmitting (see at least Cimini column 3 lines 24-35). It would have been obvious to a person or ordinary skill in the art at the time of the invention to modify

Perahia and Ma further, by alternatively using adjacent subcarrier set, in order to facilitate OFDM communication in a known manner.

Regarding **claim 28**, Perahia as modified by Ma and Cimini discloses the limitations as shown in the rejection of claim **27**. Perahia further discloses:

- *wherein said method is performed by a SISO receiver* (e.g. a receiver capable of SISO operation, see at least Figure 4, and column 9 lines 44-67)

Regarding **claim 29**, Perahia as modified by Ma and Cimini discloses the limitations as shown in the rejection of claim **27** and **29**. Perahia further discloses:

- *wherein said indication is transmitted in a SIGNAL field that complies with the 802.11 a/g standards* (see at least column 6 lines 47-57).

Regarding **claim 30**, Perahia discloses *a receiver* (i.e. wireless bridge as shown Figure.1) *in a multiple antenna communication system having at least one transmitter having N* (see at least column 4 lines 16-21) *transmit antennas* (see at least Figure 3), *comprising:*

- *at least one receive antenna for receiving a legacy preamble having at least one long training symbol and an indication of a duration of a transmission of said data*(see at least column Figure 5 lines 24-45),,
    - *and N-1 additional* (see at least column Figure 5 lines 24-45, where N is 2 in Perahia's instant embodiment) *long training symbols on each of said N transmit antennas,*
    - *each of said long training symbols having a plurality* (e.g. 64 subcarrier values) *of subcarriers* (see at least column 3 lines 50-67),

- *and means for deferring for said indicated duration of said transmission of said data* (see at least Figure 5 and column 6 lines 38-45).

Perahia may have failed to disclose *each of said long training symbols to be transmitted on each of said N transmit antennas having two or more portions, each of said N transmit antennas having a set of a plurality of subcarriers, where in each of said sets of said plurality of subcarriers are grouped into a plurality of subcarrier subgroups, wherein each subcarrier group comprises tow or more adjacent subcarriers and wherein each portion of each long training symbol is transmitted on a different transmit antenna in a given time interval using a subcarrier subgroup.* However, in an analogous art, Ma discloses transmitting a symbol (e.g. header symbol) in which sub-carriers of a header OFDM symbol are divided into a set of sub-carriers for each plurality of antennas, with each antenna transmitting the header symbol only on the respective set of subcarriers (i.e. each antennas has a set of subcarriers different from others) (see at least Ma paragraph [0017] - [0018]). It would have been obvious for a person of ordinary skill in the art at the time of the invention to modify Perahia in view of Ma, by transmitting the long symbol with different set of subcarriers on different antennas in order to realize the advantages (e.g. spatial diversity) of the OFDM system.

The Examiner notes that the sub-carriers set of Ma contains non-contiguous subcarriers rather than the adjacent subcarriers as claimed. However, in yet another analogous art, Cimini discloses providing particular adjacent subcarriers (e.g. adjacent tones) set to each antennas for transmitting (see at least Cimini column 3 lines 24-35). It would have been obvious to a person or ordinary skill in the art at the time of the invention to modify

Perahia and Ma further, by alternatively using adjacent subcarrier set, in order to facilitate OFDM communication in a known manner.

5. **Claim 2, 5, 6, 11, 16, 19, 20** and **24** are rejected under 35 U.S.C. 103(a) as being unpatentable over Perahia in view of Ma and Cimini, and further in view of US 20040141548 A1 Shattil (hereinafter Shattil).

Regarding **claim 2**, Perahia as modified by Ma and Cimini discloses the limitations as shown in the rejection of claim **1**. Perahia further discloses that the subcarriers used to modulate a symbol can be grouped (e.g. specified, see at least column 6 lines 58-65). Perahia does not disclose that *the* grouping *is based on a blocking technique.* However, in an analogous field of endeavor, Shattil teaches using different sets (blocks of subcarrier, more specifically when one block of subcarrier is used to modulate a symbol, the said block of subcarrier thus blocking other subcarriers from being used, therefore a blocking technique) of subcarriers to transmit symbols (see at least Shattil paragraph [0081]). It would have been obvious to a person of ordinary skill in the art to modify Perahia by applying the blocking technique taught by Shattil in order to improve efficiency and performance, as discussed by Shattil.

Regarding **claim 5**, Perahia as modified by Ma and Cimini discloses the limitations as shown in the rejection of claim **1**. Perahia further discloses that the subcarriers used to modulate a symbol can be grouped (e.g. specified, see at least column 6 lines 58-65). Perahia does not specifically teach *wherein said subcarrier subgroups transmitted by a given transmit antenna are varied for each of the N long training symbols transmitted by said given transmit antenna*. However, in an analogous field of endeavor, Shattil

teaches using different groups of subcarriers to modulate a symbol (see at least Shattil paragraph [0081]). It would have been obvious to a person of ordinary skill in the art to modify Perahia in view of Shattil in order to improve efficiency and performance, as discussed by Shattil.

Regarding **claim 6**, Perahia as modified by Ma, Cimini and Shattil discloses the limitations as shown in the rejection of claim **1** and **5**. Perahia further discloses that the subcarriers used to modulate a symbol can be grouped (e.g. specified, see at least column 6 lines 58-65). Perahia does not specifically teach *wherein after transmission of said N long training symbols by each of said N transmit antennas, each of said N transmit antennas has transmitted each subcarrier of said long training symbols only once.* However, in an analogous field of endeavor, Shattil teaches using different groups of subcarriers to modulate a symbol (see at least Shattil paragraph [0081], therefore if a different set of subcarrier is applied to a different symbol e.g. the mapping is one to one, then the set of subcarriers will only be transmitted once for that series of symbols). It would have been obvious to a person of ordinary skill in the art to modify Perahia in view of Shattil in order to improve efficiency and performance, as discussed by Shattil.

Regarding **claim 11**, Perahia as modified by Ma and Cimini discloses the limitations as shown in the rejection of claim **1.** Perahia does not specifically teach *wherein each of said long training symbols are orthogonal in the frequency domain.* However, in an analogous field of endeavor, Shattil teaches using different groups of subcarriers to modulate a symbol (see at least Shattil paragraph [0081], therefore symbols modulated by different groups of subcarriers, which are orthogonal due to the nature of OFDM, are

orthogonal as well). It would have been obvious to a person of ordinary skill in the art to modify Perahia in view of Shattil in order to improve efficiency and performance, as discussed by Shattil.

Regarding **claim 16**, Perahia as modified by Ma and Cimini discloses the limitations as shown in the rejection of claim **15**. Perahia further discloses that the subcarriers used to modulate a symbol can be grouped (e.g. specified, see at least column 6 lines 58-65). Perahia does not disclose that *the* grouping *is based on a blocking technique.* However, in an analogous field of endeavor, Shattil teaches using different sets (blocks of subcarrier, more specifically when one block of subcarrier is used to modulate a symbol, the said block of subcarrier thus blocking other subcarriers from being used, therefore a blocking technique) of subcarriers to transmit symbols (see at least Shattil paragraph [0081]). It would have been obvious to a person of ordinary skill in the art to modify Perahia by applying the blocking technique taught by Shattil in order to improve efficiency and performance, as discussed by Shattil.

Regarding **claim 19**, Perahia as modified by Ma and Cimini discloses the limitations as shown in the rejection of claim **15** and **18**. Perahia further discloses that the subcarriers used to modulate a symbol can be grouped (e.g. specified, see at least column 6 lines 58-65). Perahia does not specifically teach *wherein said subcarrier subgroups transmitted by a given transmit antenna are varied for each of the N long training symbols transmitted by said given transmit antenna*. However, in an analogous field of endeavor, Shattil teaches using different groups of subcarriers to modulate a symbol (see at least Shattil paragraph [0081]). It would have been obvious to a person of

ordinary skill in the art to modify Perahia in view of Shattil in order to improve efficiency and performance, as discussed by Shattil.

Regarding **claim 20**, Perahia as modified by Ma, Cimini and Shattil discloses the limitations as shown in the rejection of claim **15, 18** and **19**. Perahia further discloses that the subcarriers used to modulate a symbol can be grouped (e.g. specified, see at least column 6 lines 58-65). Perahia does not specifically teach *wherein after transmission of said N long training symbols by each of said N transmit antennas, each of said N transmit antennas has transmitted each subcarrier of said long training symbols only once.* However, in an analogous field of endeavor, Shattil teaches using different groups of subcarriers to modulate a symbol (see at least Shattil paragraph [0081], therefore if a different set of subcarrier is applied to a different symbol e.g. the mapping is one to one, then the set of subcarriers will only be transmitted once for that series of symbols). It would have been obvious to a person of ordinary skill in the art to modify Perahia in view of Shattil in order to improve efficiency and performance, as discussed by Shattil.

Regarding **claim 24**, Perahia as modified by Ma and Cimini discloses the limitations as shown in the rejection of claim **15.** Perahia does not specifically teach *wherein each of said long training symbols are orthogonal in the frequency domain.* However, in an analogous field of endeavor, Shattil teaches using different groups of subcarriers to modulate a symbol (see at least Shattil paragraph [0081], therefore symbols modulated by different groups of subcarriers, which are orthogonal due to the nature of OFDM, are orthogonal as well). It would have been obvious to a person of ordinary skill in the art to

modify Perahia in view of Shattil in order to improve efficiency and performance, as discussed by Shattil.

6. **Claim 3, 7, 17** and **21** is rejected under 35 U.S.C. 103(a) as being unpatentable over Perahia in view of Ma and Cimini, and further in view of US 20030123381 A1 Zhuang et al. (hereinafter Zhuang).

Regarding **claim 3**, Perahia as modified by Ma and Cimini discloses the limitations as shown in the rejection of claim **1**. Perahia further discloses that the subcarriers used to modulate a symbol can be grouped (e.g. specified, see at least column 6 lines 58-65). Perahia does not specifically teach the grouping is *based on an interleaving technique*. However, in an analogous field of endeavor, Zhuang discloses modulating OFDM symbol over interleaved subcarriers (i.e. interleaving technique). it would have been obvious to a person of ordinary skill in the art to modify Perahia in view of Zhuang in order to fully realized the advantage of OFDM system as discussed by Zhuang(see at least Zhuang paragraph [0002]).

Regarding **claim 7**, Perahia as modified by Ma and Cimini discloses the limitations as shown in the rejection of claim **1**. Perahia does not specifically disclose *wherein a sequence of each of said long training symbols on each of said N transmit antennas are orthogonal.* However, in an analogous field of endeavor, Zhuang discloses modulating OFDM symbol using different subcarriers for different antenna (see at least paragraph [0019]), therefore symbols on each of the transmit antennas will be orthogonal due to modulation by orthogonal subcarriers. it would have been obvious to a person of ordinary skill in the art to modify Perahia in view of Zhuang in order to fully realized the

advantage of OFDM system as discussed by Zhuang (see at least Zhuang paragraph [0002]).

Regarding **claim 17**, Perahia as modified by Ma and Cimini discloses the limitations as shown in the rejection of claim **15**. Perahia further discloses that the subcarriers used to modulate a symbol can be grouped (e.g. specified, see at least column 6 lines 58-65). Perahia does not specifically teach the grouping is *based on an interleaving technique*. However, in an analogous field of endeavor, Zhuang discloses modulating OFDM symbol over interleaved subcarriers (i.e. interleaving technique). it would have been obvious to a person of ordinary skill in the art to modify Perahia in view of Zhuang in order to fully realized the advantage of OFDM system as discussed by Zhuang(see at least Zhuang paragraph [0002]).

Regarding **claim 21**, Perahia as modified by Ma and Cimini discloses the limitations as shown in the rejection of claim **15**. Perahia does not specifically disclose *wherein a sequence of each of said long training symbols on each of said N transmit antennas are orthogonal.* However, in an analogous field of endeavor, Zhuang discloses modulating OFDM symbol using different subcarriers for different antenna (see at least paragraph [0019]), therefore symbols on each of the transmit antennas will be orthogonal due to modulation by orthogonal subcarriers. it would have been obvious to a person of ordinary skill in the art to modify Perahia in view of Zhuang in order to fully realized the advantage of OFDM system as discussed by Zhuang (see at least Zhuang paragraph [0002]).

7. **Claim 14** rejected under 35 U.S.C. 103(a) as being unpatentable over Perahia in view of Ma and Cimini, and further in view of US 7103325 B1 Jia et al.(hereinafter Jia) Regarding **claim 14**, Perahia as modified by Ma and Cimini discloses the limitations as shown in the rejection of claim 1. Perahia does not specifically discloses *transmitting a field indicating said number N of transmit antennas.* However, in an analogous field of endeavor, Jia teaches transmitting to a receiver information regarding number of antennas used for communication (see at least column 6 lines 46-49 and column 8 lines 67 and column 9 lines 1-2). It would have been obvious to a person of ordinary skill in the art to modify Perahia in view of Jia to transmit the information regarding number of antennas used for the transmission in order to efficiently configure the communication device as taught by Jia.

Response to Arguments

8. Applicant's arguments have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to YU (Andy) GU whose telephone number is (571)270-7233. The examiner can normally be reached on Mon-Thur 8:30-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lester G. Kincaid can be reached on 5712727922. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/YU (Andy) GU/
Examiner, Art Unit 2617

/LESTER KINCAID/
Supervisory Patent Examiner, Art Unit 2617